

**PREASSESSMENT SCREEN AND DETERMINATION
for
NATURAL RESOURCE DAMAGES RELATED TO
RELEASES AT OR FROM THE DOW CHEMICAL COMPANY
MANUFACTURING PLANT PROPERTY AT MIDLAND, MICHIGAN**

I. INTRODUCTION, AUTHORITIES, AND DELEGATIONS

This determination concerns potential claims for damages to natural resources related to releases of hazardous substances from The Dow Chemical Company (Dow) manufacturing plant property at Midland, Michigan, authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. §9607(f); Section 311(f) of the Clean Water Act (CWA), as amended, 33 U.S.C. §1321(f); Section 1006 of the Oil Pollution Act (OPA), as amended, 33 U.S.C. §2706; and other applicable federal, tribal, and state law and authorities including, but not limited to, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), as amended, 40 C.F.R. Part 300, and Part 201 of the Michigan Natural Resources and Environmental Protection Act 451 of 1994, as amended (Part 201).

The Trustees for natural resources for this case as of this date are the State of Michigan (State), acting through the Director of the Michigan Department of Environmental Quality (MDEQ), the Director of the Michigan Department of Natural Resources (MDNR) and the Attorney General of the State of Michigan; the United States Department of the Interior (DOI), acting through its representatives, the Fish and Wildlife Service (Service) and the Bureau of Indian Affairs (BIA); and the Saginaw Chippewa Indian Tribe of Michigan.

The purpose of the preassessment screen is to provide a rapid review of readily available information on releases of hazardous substances from the Dow manufacturing plant property at Midland, Michigan, and potential impacts on natural resources for which the Trustees may assert trusteeship. The preassessment screen is not intended to be a comprehensive examination of all existing information.

This determination recognizes that there is a reasonable probability that a claim for damages to natural resources within the trusteeship of the Trustees exists in this case on the basis of existing information.

This determination was prepared by the Trustees under the authority of Section 107(f) of CERCLA, as amended, 42 U.S.C. §9607(f), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), as amended, 40 C.F.R. Part 300, the DOI Natural Resource Damage Assessment Regulations, 43 CFR Part 11, Part 201 of the Michigan Natural Resources and Environmental Protection Act 451 of 1994, as amended (Part 201), and other applicable federal, tribal, and state regulations and directives, which serve to designate federal, state, and tribal natural resource trustees, and which authorize the recovery of natural resource damages.

II. INFORMATION ON THE SITE

A. Information on the site and on the discharge or release

Dow's Midland manufacturing plant property covers approximately 1,900 acres along the Tittabawassee River and includes Dow's world headquarters, research and development facilities, manufacturing units for plastics, agricultural chemicals and other organic and inorganic chemicals, a wastewater treatment system, and hazardous waste treatment, storage and disposal units, including incinerators. In addition to typical primary and secondary treatment tanks, Dow's wastewater treatment system includes three tertiary treatment ponds that operate in series and cover about ten percent, or 200 acres, of the total manufacturing plant property acreage. Another large pond, known as the brine pond (also referred to as the 6-Pond) was used to contain accumulated spent brine until it was piped to the network of brine disposal wells for re-injection into the geologic formation from which the brine was extracted. These re-injection wells were located in Midland, Saginaw, and Bay counties, and were plugged in the late 1980's and no longer used. Currently, groundwater contaminated with brine is collected from multiple Dow brine remediation sites located in Midland, Saginaw, and Bay counties and piped back to the brine pond for holding prior to disposal through Dow's waste water treatment plant. The brine pond covers another seven percent, or 130 acres, of the total manufacturing plant property acreage. Numerous other large wastewater ponds also existed historically on the Dow property on the eastern side of the Tittabawassee River. These ponds were taken out of service, filled with waste, and capped in the 1970s and 1980s.

Dow's hazardous waste operations are regulated by the MDEQ, as the lead agency, and the United States Environmental Protection Agency (EPA), in an oversight role, under the authority of the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, and other applicable federal and state laws. RCRA regulatory oversight is being conducted by the MDEQ for corrective action that Dow is implementing for releases at and from the Midland manufacturing plant property. The major areas of concern for off-site corrective action activities include Midland area soils, the Tittabawassee and Saginaw Rivers and their floodplains, and the Saginaw Bay.

The corrective action underway by Dow at this time includes remedial investigations and interim response activities. Remedial Investigation Work Plans (RIWPs) have been proposed by Dow for the Midland area soils and the Tittabawassee River and floodplain. The MDEQ and the EPA reviewed these work plans and found them to be substantially deficient. Dow is in the process of revising the RIWPs. The MDEQ has approved, on a pilot basis, a floodplain soil and characterization program for part of the Tittabawassee River beginning at the confluence of the Chippewa and Tittabawassee Rivers and continuing downstream for six miles. If successful, it is anticipated that this process will be extended to the remaining downstream portion.

Interim response activities being conducted by Dow include measures to reduce exposure to soils at certain residential and recreational properties in Midland and along the Tittabawassee River. The MDEQ and Michigan Department of Community Health have taken responsibility for developing fish consumption and contamination advisory

signs, working with local units of government for sign installation, and participating in the development of public informational pamphlets. This work was conducted with funding by Dow.

In addition to this corrective action work, the MDEQ conducted a floodplain soil and sediment investigation in the Saginaw River and Saginaw Bay from 2003 through 2005 under a grant from the U.S. EPA's Great Lakes National Program Office.

For the purposes of this preassessment screen, the Site includes the Dow Midland manufacturing plant property, the aerial deposition zone for airborne matter originating from the property, the Tittabawassee River and its floodplains downstream of Midland, the Saginaw River and its floodplains, and Saginaw Bay. The Tittabawassee River flows southeast from Midland for approximately 23 miles and then joins with the Shiawassee River to form the Saginaw River. The Saginaw River flows north-northeast from this confluence approximately 22 miles to where it empties into Saginaw Bay of Lake Huron. The aerial deposition zone includes portions of the city of Midland located in the predominant wind direction to the north and east of the Dow manufacturing plant where air-borne deposition of hazardous substances is known to have occurred.

Land use in the city of Midland is largely urban and industrial and includes a number of public parks and schools. The land uses of the Tittabawassee River corridor are dominated by residential, agricultural, public parks, and other protected areas, including the Shiawassee National Wildlife Refuge (NWR). Land use around the confluence with the Saginaw River near the city of Saginaw is largely urban and industrial. Land use along the Saginaw River includes urban and industrial areas at Saginaw and Bay City as well as residential, agricultural, public parks, and other protected areas, including the Crow Island State Game Area.

The Site includes a variety of habitats, including free-flowing river, riffle and pool areas, emergent wetlands, floodplain forests, upland forests, lakeplain prairie, shelterbelts, agricultural fields, fallow fields, residential areas, and tertiary and brine ponds on the Dow manufacturing property. Because of this habitat diversity, the diversity of wildlife is high. For example, 277 species of birds have been recorded at the Shiawassee NWR alone (U.S. Fish and Wildlife Service, 2005).

1. History of current and past use of the site

Dow began manufacturing operations at the Midland plant property in 1897. Initial operations included the production of bromine and chlorine through the electrolysis of brine extracted from production wells. In the early 1900s, Dow began producing a variety of chemicals in addition to its major products, bromides and bleach. Currently, about thirty production plants are in operation, along with a centralized research and development campus. The major products include plastics, agricultural chemicals, and other organic and inorganic chemicals

Corrective action documents that Dow submitted to the MDEQ in 2005-2006 state that over 1,000 different inorganic and organic chemicals have been produced at the Midland plant property (Dow Chemical Company, 2005; Ann Arbor Technical Services, Inc., 2006). The limited information provided by Dow in these documents on historic and current manufacturing activities at the Midland plant property is summarized in Table 1.

Table 1. Dow Chemical Company Manufacturing Activities: Midland, Michigan

Time Period	Products and Processes
1900 – 1915	Processes primarily related to chlorine-caustic soda electrolysis <ul style="list-style-type: none"> • bleaching powder • chloroform • carbon tetrachloride • benzyl chloride • benzoic acid • caustic soda • bromides • lead arsenate • sodium chloride • magnesium chloride • calcium chloride • mining salts • phenol • calcium sulfide • liquid chlorine • sulfur chloride
1915 - 1939	Sulfonation and other processes added <ul style="list-style-type: none"> • trinitrophenol • mustard agent • Epsom salts • 1,1,1-trichloroethane • vinylidene chloride • monochlorobenzene • hexachloroethane • chlorinated phenols • ethyl cellulose • magnesium metal • acetylsalicylic acid (aspirin) • styrene monomer • vinyl chloride
1940 – 1959	Expanded production of existing products and added products <ul style="list-style-type: none"> • ethanolamines • monochlorobenzene • phenol • Saran resin • Styron polystyrene • 2,4-dichlorophenoxyacetic acid (2,4-D) herbicide • Kuron herbicide containing 2,4,5-trichlorophenoxypropionic acid (Silvex) • STYROFOAM™ brand plastic foam • polyvinyl chloride • soil fumigant • weed killers • ethylene dibromide • methyl styrene • plastic and plastic lattices • styrene • trichlorophenol • parachlorophenol • tetrachlorobenzene

Time Period	Products and Processes
1960-1979	<p>Modernized chlorine-caustic facilities, built a new 2,4-D plant, expanded production capacity and increased the number of products. Products included the following:</p> <ul style="list-style-type: none"> • Dursban™ and Lorsban™ chlorpyrifos insecticides • ortho-dichlorobenzene • monochlorobenzene • trichlorophenol • bisphenol A • para-dichlorobenzene • trichlorobenzene • pentachlorophenol • bromine • ethyl benzene • tetrachlorobenzene • styrene • polystyrene <p>Ceased production of:</p> <ul style="list-style-type: none"> • 1,2-dibromo-3-chloropropane (Fumazone™ active ingredient) • Ronnel™ fenchlorophos insecticide
1980 - 1999	<p>Decreased production capacity and range of products and exited the brine business.</p> <p>Ceased production of:</p> <ul style="list-style-type: none"> • pentachlorophenol (1980) • chlorine/caustic soda
2000 - 2006	<p>Expansion of plastics and agricultural products businesses. About 30 production plants in operation along with research and development activities that serve Dow's global operations.</p>

2. Hazardous substances of concern

The primary hazardous substances of concern are polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs). Releases of these compounds from Dow's Midland manufacturing property have been documented by Dow, the EPA, and the MDEQ in a series of studies conducted by Dow and the EPA in the early 1980s, and by the MDEQ and Dow in the 1990s through the present. Limited river sediment data documents that hazardous substances other than PCDD/Fs have been released to the Tittabawassee River by Dow and other upstream sources. In addition, MDEQ and Dow study data on caged and native fish document the uptake of PCDD/Fs and other hazardous substances in fish tissue.

Further remedial investigation studies currently planned or in progress will provide additional information on other hazardous substances that may have been released.

3. Time, quantity, duration and frequency of releases and discharges

No reliable information is publicly available to quantify the duration and frequency of all of the releases and discharges from the Dow manufacturing plant property since it began operating. However, given the substantial documentation in regulatory agency files and public records of releases and discharges throughout the history of the plant, it

is likely that significant releases of hazardous substances occurred throughout the historical operations at the plant.

PCDD/Fs were byproducts of the chlorine-caustic process, production of chlorophenolic herbicides and pesticides, and possibly the production of magnesium metal. PCDD/Fs and other hazardous substances were released from the Dow plant through surface water and groundwater releases, waste disposal processes, fugitive emissions and from on-site waste burning/incineration, which dates back to around 1930. These releases most likely commenced when chemical production began in the late 1890s, and have continued through the present, although to a lesser degree since the enactment and implementation of environmental laws dating from the 1970s.

Prior to the 1920s, Dow discharged wastes from the manufacturing plant property directly to the Tittabawassee River. Starting in the 1920s, aqueous wastes were typically managed in ponds and discharged during high river flow periods. Dow began treatment of phenolic wastes in the 1930s, and constructed a general wastewater treatment plant on the east side of the river in 1945. The treatment plant discharged wastewater to the river. Evidence of discharges to the Tittabawassee River is visible in aerial photos dating back to 1932. Dow upgraded the wastewater treatment plant over time, and constructed tertiary treatment ponds for further treatment (e.g., temperature and flow equalization, additional solids settling) in 1974. Around this time, Dow eliminated approximately 10 direct discharges to the river. In 1984, Dow added garnet sand filters for particulate removal prior to discharge to the river and then added carbon filtration in 1999 and an enhanced solids removal system in 2000 for additional removal of organic compounds. In 1986, Dow's wastewater treatment plant was inundated with floodwater and likely released untreated wastewater to the Tittabawassee River.

Dow's historical and current waste disposal and management areas are located immediately adjacent to the Tittabawassee River, where it flows through the Dow plant property. Starting in the 1920s, wastes were placed in large ponds along the east side of the river. These were later filled in with additional waste to form what is now referred to as the "1925 Landfill." Records submitted to the MDEQ document that approximately 1.8 million tons of waste were historically disposed of in this manner. Aerial photos that date back to 1932 clearly show the location of historical and current waste management areas on the east side of the Tittabawassee River. Dow's tertiary wastewater treatment and brine ponds are located on the west side of the river, opposite the waste management areas described above.

Starting around 1930, Dow treated some wastes by burning them in tar burners and powerhouses. Incomplete combustion likely resulted in releases of hazardous substances to the air. In 1948, Dow began construction and operation of more sophisticated incinerators.

Other historical waste disposal operations at the Dow manufacturing plant property included deep-well injection of chemical wastes into several brine extraction wells, and the disposal of herbicide-contaminated equipment and contaminated soils on the sites of the former 2,4,5-T herbicide manufacturing plant and associated waste disposal areas. Three such areas at the Dow plant property are referred to as LEL Sites I, II, and

III (where LEL denotes areas with "locally elevated levels" of PCDD/Fs). Other on-site or contiguous areas where releases of hazardous substances have occurred include the Poseyville Landfill (a historical landfill operated by the city of Midland and later purchased by Dow in the 1980s), the Northeast Perimeter area of the property, the closed Pure Oil tank farm, and the currently operating US-10/Styrene tank farm.

4. Relevant operations occurring at or near the site

Dow has reduced surface water releases and contaminated groundwater migration from its manufacturing plant and historical disposal areas with groundwater control systems installed adjacent to the Tittabawassee River and at other locations along the property boundary. Dow first began installing groundwater collection systems in the early 1980s and they are now estimated to have a combined length of seven miles. Groundwater intercepted by this system is pumped to Dow's wastewater treatment system. However, significant leaching of wastes to the groundwater and subsequent venting of groundwater to the river likely occurred from historical waste disposal areas prior to installation of these groundwater collection systems.

Dow uses high-efficiency incineration to treat by-products and wastewaters that they generate. Air emissions from production plants and certain waste management processes have been reduced over time through the use of air emission controls, including the venting of certain units to the high-efficiency incinerator. Recently (since 2000), fugitive emissions within and from the Dow plant property have been reduced to some extent through an updated fugitive emissions control program and an exposure control program that includes perimeter and on-site vegetated/greenbelt areas and covering exposed soils with paving or gravel.

5. Potentially Responsible Parties

The Dow Chemical Company is considered to be a Potentially Responsible Party (PRP) for the releases of PCDD/Fs in and from the Midland area. In the river systems, PCDD/Fs are present at low or background levels upstream of the Dow property, and present at significantly greater concentrations downstream of the Dow property. This geographic distribution of PCDD/F contamination, and the consistency in composition of the mixture of the PCDD/F concentrations starting in the Tittabawassee River at the Dow plant property and extending downstream to the Saginaw Bay in Lake Huron, indicate that historic releases from the Dow plant property are the dominant sources of PCDD/Fs in the Tittabawassee and Saginaw Rivers. Downstream, in the Saginaw River and Bay, PCDD/Fs may also be partially the result of poor incineration of municipal sewage sludge, contamination of PCBs released by General Motors or other PRPs, atmospheric deposition, and other sources.

Former industrial operations, including the Michigan Chemical Corporation, Velsicol Chemical Corporation, Total Petroleum, Inc., and other industrial sites and wastewater treatment plants historically discharged to the Pine and Chippewa Rivers upstream of Dow. Dichlorodiphenyltrichloroethane (and its daughter products) and polybrominated biphenyls detected in fish tissue and river sediments are believed to be attributable to Velsicol. However, based on available river sediment and floodplain soil data, upstream

Velsicol. However, based on available river sediment and floodplain soil data, upstream sources do not appear to contribute appreciably to PCDD/F levels.

B. Damages excluded from liability under CERCLA

Title 43 CFR Part 11.24(b) identifies damages that are excluded from liability under CERCLA and requires the authorized official to determine whether:

- the damages resulting from the discharge or release were specifically identified as an irreversible and irretrievable commitment of natural resources in an environmental impact statement or other comparable environmental analysis, that the decision to grant the permit or license authorizes such commitment of natural resources, and that the facility or project was otherwise operating within the terms of its permit or license; or
- the damages and the release of a hazardous substance from which such damages resulted have occurred wholly before enactment of CERCLA; or
- the damages resulted from the application of a pesticide product registered under the Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. 136; or
- the damages resulted from any other federally permitted release, as defined in Section 101 (10) of CERCLA.

None of these exclusions are known to apply to the release of PCDD/Fs from the Dow Midland manufacturing plant operations.

III. PRELIMINARY IDENTIFICATION OF RESOURCES POTENTIALLY AT RISK

A. Preliminary identification of pathways

PCDD/Fs and other hazardous substances have been released to the waters of the Tittabawassee River from the Dow Midland manufacturing plant. Once in the river system, the hazardous substances have moved downstream while dissolved in the water and while sorbed to particulates. Particulates with hazardous substances sorbed to them move through river systems in several ways. Fine particles may remain suspended in the water column for long periods of time, while larger particles may alternately become suspended and deposited. Suspended particles may be deposited on floodplains and in areas of the river with slow flows. Larger particles moving as part of the bedload of the river are generally deposited in bars in the river, and in berms adjacent to the rivers. Bars and berms are temporary, and particulates there can be re-mobilized during flood events and through bank erosion. PCDD/Fs are present in sediments and floodplain soils of the Tittabawassee River, and the concentrations and patterns of PCDD/F congeners indicate that Dow's Midland manufacturing property is the major source of these hazardous substances (MDEQ, 2003). The sediments in the Saginaw River and Bay also contain elevated concentrations of PCDD/Fs consistent with the same releases (MDEQ, 2006a).

PCDD/Fs from the water, sediments, and floodplain soils in the Tittabawassee/Saginaw River systems are taken up by organisms in both the aquatic and terrestrial environments. A review of data available in 2005 showed that PCDD/Fs are present in the river systems at concentrations greater than in reference areas for aquatic and terrestrial plants, benthic invertebrates, emergent forms of the benthic invertebrates, forage and predatory fish species, birds, soil invertebrates (including earthworms), herbivorous mammals, and insectivorous mammals (Galbraith, 2005).

PCDD/Fs and other hazardous substances have been released to the air from Dow's historical manufacturing plant property operations and have been deposited on soils in downwind areas. The extent of this deposition is being investigated as part of the corrective action.

PCDD/Fs from aerial deposition that are found in upland soils may be available to soil invertebrates (including earthworms), amphibians, reptiles, mammals, and birds in the terrestrial food web, but no site-specific data is available to evaluate this.

PCDD/Fs and other hazardous substances on Dow's manufacturing plant property may also be available to organisms. In particular, the tertiary wastewater treatment ponds, the brine pond, and the surrounding area provide attractive habitat for wildlife including waterfowl, white-tailed deer, fox, and woodchuck. Wildlife using the ponds may be exposed to PCDD/Fs and other hazardous substances by consuming or coming in contact with the water, sediments, aquatic plants, insects and other invertebrates, amphibians, reptiles or fish present in the ponds. Dow is currently removing accumulated solids known to contain high levels of PCDD/Fs from the tertiary pond. The significance of this exposure pathway may require further investigation. The brine pond has not yet been adequately investigated, so it is not known how the levels of PCDD/Fs in the brine pond compare to those in the tertiary ponds. Other hazardous substances may also be present in the brine pond. The significance of this potential exposure pathway is not known at this time.

B. Exposed areas

About 55 river miles of the Tittabawassee and Saginaw Rivers are exposed, including soils in their associated floodplains. Data collected by the MDEQ in 2004 indicate that areas of the inner Saginaw Bay contain elevated concentrations of PCDD/Fs (MDEQ, 2006a). Further investigation will be required to determine the extent of impact to Saginaw Bay. The combined exposed surface area of the tertiary ponds is approximately 200 acres. The exposed surface area of the brine pond is approximately 130 acres.

C. Exposed water estimates

The amount of exposed water in the Tittabawassee and Saginaw Rivers varies seasonally. The floodplains are periodically inundated by flood waters, with more extensive flooding along the Tittabawassee River. The average discharge rate for the Tittabawassee River at Midland is 1,717 cubic feet per second (cfs) based on data from 1937 to 2005 (U.S. Geological Survey, 2006). The average discharge rate for the

Saginaw River at Saginaw is 4,475 cfs based on data from 1992 to 2005 (U.S. Geological Survey, 2006). During this same timespan, the average discharge rate for the Tittabawassee River at Midland was 1,814 cfs.

The licensed capacity of the tertiary ponds is 783 million gallons of secondary wastewater treatment system effluent, with a maximum licensed treatment/throughput rate of 50 million gallons per day. However, this is more than double the normal average daily discharge rate of treated wastewater to Dow's NPDES Outfall 031 in the Tittabawassee River. The latest available estimate of sediments in the brine pond is 950,000 cubic yards. These sediments are covered by water that is discharged to the pond from Dow's brine remediation system at a rate of approximately one million gallons per day of system operation.

D. Estimates of concentrations

1. Sediments and Soils

Based on samples analyzed to date, preliminary ranges have been established for concentrations of PCDD/Fs in the Tittabawassee River, Saginaw River and Saginaw Bay (MDEQ, 2003; MDEQ 2006a). Concentrations of PCDD/Fs were used to calculate toxic equivalents (TEQs) based on toxic equivalency factors for humans and other mammals developed by the World Health Organization (WHO; van den Berg et al., 1998). TEQs from PCDD/Fs in Tittabawassee River sediments downstream of Midland range up to 19,000 parts per trillion (ppt), and TEQs in floodplain soils range up to 23,000 ppt. Concentrations in Saginaw River sediments range up to 19,000 ppt TEQ, and concentrations in floodplain soils range up to 850 ppt TEQ. Concentrations in Saginaw Bay sediments range up to 1,200 ppt TEQ in sediments and concentrations in coastal floodplain soils range up to 230 ppt TEQ.

2. Fish

In 2002, MDNR and MDEQ collected fish from the Tittabawassee River between Midland and the confluence with the Saginaw River. Individual whole fish were analyzed. Galbraith (2003) calculated toxic equivalents (TEQs) of PCDD/Fs based on toxic equivalency factors for birds (van den Berg et al., 1998) for use in an ecological risk assessment. Average TEQs for the four species collected ranged from 73 to 307 pg/g, wet weight (Table 2).

Table 2. Average TEQs in native fish collected from the Tittabawassee River in 2002

Native Fish	TEQ in pg/g, wet weight^a
Bass (n=12)	73
Catfish (n=24)	85
Shad (n=23)	236
Carp (n=26)	307

^a TEQs are calculated using WHO toxic equivalency factors for birds.

3. Wild Game

Dow collected wild game from the Tittabawassee River floodplain from November 2003 through January 2004 (Entrix, 2004). Analyses of these samples indicate that deer, turkey and squirrel collected near the Tittabawassee River downstream of Midland had greater concentrations of PCDD/Fs than those collected from upstream locations (Table 3). In September 2004, the Michigan Department of Community Health issued a consumption advisory for wild game based on these results.

Table 3. TEQs from PCDD/Fs in wild game collected near the Tittabawassee River in 2003-2004

Location	TEQ in pg/g wet weight ^a											
	Deer Muscle			Deer Liver			Turkey Meat			Squirrel Muscle		
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max
Upstream	0.067	0.036	0.17	0.57	0.22	1.3	0.18	0.11	0.39	0.071	0.040	0.11
Downstream (Smith's Crossing)	0.17	0.12	0.26	11	5.6	19	10	0.63	25	0.40	0.092	1.5
Downstream (Imerman Park)	0.52	0.23	1.2	64	8.9	150	13	13	13	1.3	0.083	4.3

^a TEQs are calculated using WHO toxic equivalency factors for humans and other mammals.

E. Potentially affected resources and services

Natural resources that have been affected or potentially affected by releases of hazardous substances include surface water and sediments of the Tittabawassee and Saginaw Rivers and Saginaw Bay, groundwater, floodplain soils, terrestrial and aquatic plants, aquatic invertebrates, resident and migratory fish, terrestrial invertebrates, amphibians, reptiles, mammals and birds. Examples of species of animals that are likely to have been exposed to hazardous substances include smallmouth bass, catfish, walleye, white sucker, gizzard shad, lake sturgeon, common carp, snapping turtle, earthworm, deer mouse, muskrat, mink, river otter, white-tailed deer, wild turkey, American woodcock, great-horned owl, bald eagle, wood duck, hooded merganser, Caspian and common terns, belted kingfisher, great blue heron, American robin, red-winged blackbird, tree swallow, eastern bluebird and yellow warbler.

Several species that have been affected or potentially affected by releases of hazardous substances are listed as threatened, endangered, or of special concern by the State of Michigan or the federal government. Lake sturgeon, Caspian terns, common terns, and bald eagles are listed as threatened by the State of Michigan, and other state listed species may also be found in the area. The bald eagle is also listed as threatened under the federal Endangered Species Act. The Indiana bat is listed as endangered by the State of Michigan and under the federal Endangered Species Act and could potentially be found in the area. The eastern massasauga rattlesnake is federally listed as a candidate species and may be found in the area.

Ecological risk assessments of the aquatic and terrestrial food chains of the Tittabawassee River prepared for the State of Michigan indicate that many species are at risk from PCDD/Fs (Galbraith, 2003; Galbraith, 2004). The data used in the risk assessments indicate that trust resources may be injured, as defined in 43 CFR 11.62(f). Injuries may include reproductive impairment, disease, behavioral abnormalities, physiological malfunctions, and/or tissue levels exceeding levels at which the state issues consumption advisories.

People value the natural resources of the Site and use them for fishing, hunting, trapping, plant gathering, boating, wildlife viewing, hiking, and general recreation. Public use sites include local, county, and state parks and a national wildlife refuge. Public amenities include a nature center used by school children, boat launches, hiking trails, access for shore fishing, sports fields, playgrounds, and picnic areas. Members of the Saginaw Chippewa Indian Tribe of Michigan place spiritual and cultural values on the natural resources of the Site.

Because of contamination of natural resources by PCDD/Fs, the State of Michigan has issued advisories that apply to many of these uses in the Tittabawassee River, and for some advisories, in the Saginaw River and Bay as well (MDEQ, 2006b). Fish consumption advisories have been in effect since 1978. From 1978 to 1986, the fish advisory recommended no consumption of any species of fish from the Tittabawassee or Saginaw Rivers. The advisories since 1986 have included a recommendation for no consumption of some species of fish, restricted consumption of some species or sizes of fish, and no restrictions on some species or sizes of fish.

The State of Michigan first issued a wild game advisory in 2004 following analysis of samples of white-tailed deer, turkeys, and squirrels collected in the Tittabawassee River floodplain. For game harvested in or near the floodplain downstream of Midland, the advisory recommends no consumption of liver and limited consumption of muscle meat from deer, no consumption of turkey, and limited consumption of squirrel. The advisory states that other species that were not tested may also contain elevated concentrations of PCDD/Fs and that soil and sediment data suggest that game harvested along the Saginaw River may also contain elevated concentrations of PCDD/Fs.

In addition, the State of Michigan issued advisories for food farming and gardening in 2002 and for soil movement in 2003.

IV. PREASSESSMENT SCREEN CRITERIA

Title 43 CFR Part 11.23(e) lists five criteria that must be met before proceeding with a natural resource damage assessment.

Criterion #1: Discharges of oil and releases of hazardous substances have occurred.

Releases of hazardous substances have occurred and will continue to occur at this Site (Section II.A., above).

Criterion #2: Natural resources for which the Trustees may assert trusteeship under CERCLA have been or are likely to have been adversely affected by the release.

Natural resources for which the Trustees may assert trusteeship under CERCLA have been or are likely to have been adversely affected by the release of PCDD/Fs at this Site (Section III.E., above).

Criterion #3: The quantity and concentration of the released hazardous substance is sufficient to potentially cause injury to those natural resources.

The quantity and concentration of the released hazardous substance is sufficient to potentially cause injury to those natural resources at this Site (Section III.E., above).

Criterion #4: Data sufficient to pursue an assessment are readily available or likely to be obtained at reasonable cost.

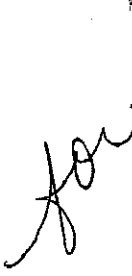
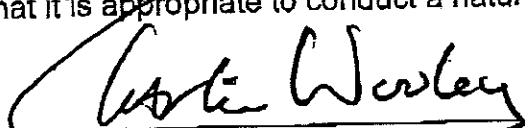
For this Site, data sufficient to pursue an assessment are readily available or are likely to be obtainable at reasonable cost. The ongoing corrective action under RCRA includes extensive data collection. The Trustees are coordinating with the response agencies (MDEQ and EPA) and Dow to maximize the use of data for both the corrective action and the natural resource damage assessment.

Criterion 5: Response actions carried out or planned will not sufficiently remedy the injury to natural resources without further action.

The Trustees intend to work closely with the response agencies and Dow to help develop response actions that halt ongoing injuries from hazardous substances while minimizing any indirect injuries that might be caused by the response actions themselves. However, no response actions are yet being planned, and the remedial investigation/feasibility study that will lead to a proposed plan is expected to take many years to complete. The Trustees believe that additional actions to address damages to natural resources will be necessary, given the extent of contamination. This contamination has resulted and will continue to result in injuries including lost services over many decades because of fish, game and soil advisories.

V. PREASSESSMENT SCREEN DETERMINATION

Based on the information contained in this Preassessment Screen, we have determined that it is appropriate to conduct a natural resource damage assessment for this Site.

 
Robyn Thorson
Regional Director, Region 3
U.S. Fish and Wildlife Service
Authorized Official for the Department of the Interior

Charles M. Wooley
Acting Regional Director

Date: 4/3/06

Steven E. Chester
Director
Michigan Department of Environmental Quality

Date: _____

Rebecca A. Humphries
Director
Michigan Department of Natural Resources

Date: _____

Kathleen Cavanaugh
Assistant Attorney General of the State of Michigan

Date: _____

Fred Cantu, Jr.
Tribal Chief
Saginaw Chippewa Indian Tribe of Michigan


Date: _____

V. PREASSESSMENT SCREEN DETERMINATION

Based on the information contained in this Preassessment Screen, we have determined that it is appropriate to conduct a natural resource damage assessment for this Site.

Robyn Thorson
Regional Director, Region 3
U.S. Fish and Wildlife Service
Authorized Official for the Department of the Interior

Date: _____


Steven E. Chester
Director
Michigan Department of Environmental Quality

Date: 10-16-06

Rebecca A. Humphries
Director
Michigan Department of Natural Resources

Date: _____

Kathleen L. Cavanaugh
Assistant Attorney General
Michigan Department of Attorney General

Date: _____

Fred Cantu, Jr.
Tribal Chief
Saginaw Chippewa Indian Tribe of Michigan

Date: _____

V. PREASSESSMENT SCREEN DETERMINATION

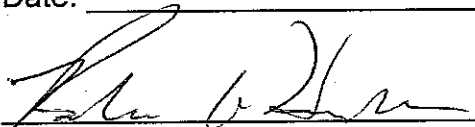
Based on the information contained in this Preassessment Screen, we have determined that it is appropriate to conduct a natural resource damage assessment for this Site.

Robyn Thorson
Regional Director, Region 3
U.S. Fish and Wildlife Service
Authorized Official for the Department of the Interior

Date: _____

Steven E. Chester
Director
Michigan Department of Environmental Quality

Date: _____



Rebecca A. Humphries
Director
Michigan Department of Natural Resources

Date: 10/30/06

Kathleen Cavanaugh
Assistant Attorney General of the State of Michigan

Date: _____

Fred Cantu, Jr.
Tribal Chief
Saginaw Chippewa Indian Tribe of Michigan

Date: _____

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Robyn Thorson
Regional Director, Region 3
U.S. Fish and Wildlife Service
Authorized Official for the Department of the Interior

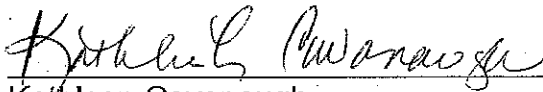
Date: _____

Steven E. Chester
Director
Michigan Department of Environmental Quality

Date: _____

Rebecca A. Humphries
Director
Michigan Department of Natural Resources

Date: _____


Kathleen Cavanaugh
Assistant Attorney General of the State of Michigan

Date: Nov 3, 2006

Fred Cantu, Jr.
Tribal Chief
Saginaw Chippewa Indian Tribe of Michigan

Date: _____

V. PREASSESSMENT SCREEN DETERMINATION

Based on the information contained in this Preassessment Screen, we have determined that it is appropriate to conduct a natural resource damage assessment for this Site.

Robyn Thorson
Regional Director, Region 3
U.S. Fish and Wildlife Service
Authorized Official for the Department of the Interior

Date: _____

Steven E. Chester
Director
Michigan Department of Environmental Quality

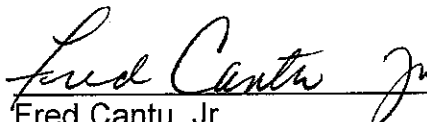
Date: _____

Rebecca A. Humphries
Director
Michigan Department of Natural Resources

Date: _____

Kathleen Cavanaugh
Assistant Attorney General of the State of Michigan

Date: _____



Fred Cantu, Jr.
Tribal Chief
Saginaw Chippewa Indian Tribe of Michigan

Date: 11-1-06

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